

Engineering Physics

Course Code	FIC 102	Course Category	FIC	L-T-P-C	2	0	1	3
Pre-Requisite Course(s)	NA	Co-Requisite Course(s)	NA	Progressive Course(s)	NA			
Course Offering Department	Physics	Professional / Licensing Standards						

Course Objectives

- Objective 1: To understand the fundamental concepts of physics and their application in engineering.
- Objective 2: To develop problem-solving skills through physics-based problems.
- Objective 3: To enhance practical knowledge through laboratory experiments and real-world applications.
- Objective 4: To foster analytical and critical thinking skills.

Course Outcome (COs)

CO's	At the end of the course the learner will be able to	Bloom's Level	Expected Proficiency Percentage	Expected Attainment Percentage
1	Apply principles of electromagnetism and optics to analyze electric fields, magnetic fields, interference, and diffraction phenomena.	3	75	70
2	Interpret modern physics concepts, photoelectric effect, and wave-particle duality, and relate them to experimental observations.	4	70	65
3	Solve basic quantum mechanical problems involving wave functions, particle in a box, and expectation values using appropriate mathematical tools.	3	70	65
4	Demonstrate understanding of quantum computation fundamentals and discuss their potential applications in emerging technologies.	3	75	70

Course Articulation Matrix (CLO) to Program Learning Outcomes (PLO)

CLOs	Program Learning Outcomes (PLO)														
	Engineering Knowledge	Problem Analysis	Design and Development	Analysis, Design and Research	Modern Tool and ICT Usage	Society and Multicultural Skills	Environment and Sustainability	Moral, and Ethical Awareness	Individual and Teamwork Skills	Communication Skills	Project Management and Finance	Self-Directed and Life Long Learning	PSO 1	PSO 2	PSO 3
Outcome 1	2	2	1	1	1			1	2			2	1	1	1
Outcome 2	2	3	2	2	2			2	2			2	2	1	1
Outcome 3	2	3	2	2	2			2	2			2	2	1	1
Outcome 4	2	3	2	2	3			2	3			2	2	1	2
Course Average	2.0	2.8	1.8	1.8	2.0			1.8	2.3			2.0	1.8	1.0	1.3

Course Unitization Plan: Theory

Unit No.	Syllabus Topics	Required Contact Hours	CLOs Addressed	References Used
Unit No. 1	ELECTRO-MAGNETISM	6		
	Electrostatic flux and Gauss's law	1	1	1, 2
	Electric field due to infinite sheet, conducting and insulating sphere.	1	1, 2, 3	1, 2
	Concept of Electrostatic Potential and Potential Energy: Capacitance of a parallel plate capacitor.	1	1, 2, 3	1, 2
	Biot-Savart Law and Ampere's circuital law: Magnetic field due to infinite wire and solenoid	1	1, 2, 3	1, 2
	Faraday's law of electromagnetic induction	1	1, 2, 3	1, 2
	Maxwell's equations (Integral form) and Physical significance	1	1	1, 2
Unit No. 2	WAVES AND OPTICAL PHYSICS	6		
	Concept of Electromagnetic waves & EMW Spectra	1	1	1, 2
	Geometrical & Wave Optics: Laws of reflection and refraction	1	1, 2, 3	1, 2
	Superposition and Concept of Interference	1	1, 2, 3	1, 2
	Double-Slit Interference	1	1	1, 2
	Diffraction: types and single slit	1	1	1, 2
	Introduction to concepts of polarisation	1	1, 2, 3	1, 2
Unit No. 3	MODERN PHYSICS	6		
	Black Body Radiation; Wien's displacement law	1	1	1, 2
	Discussion on failure of classical laws to explain Black Body Radiation, and concept of Planck's Hypothesis	1	1, 2, 3	1, 2
	What is Light? Photon and Overview on Planck Constant	1	1	1, 2
	Photoelectric effect – Concept and Experimental Setup	1	1, 2, 3	1, 2
	Photoelectric effect, the drawback of Wave theory to explain Photoelectric effect	1	1	1, 2
	Wave properties of particle: Matter Waves and De Broglie Hypothesis	1	1	1, 2
Unit No. 4	BASICS OF QUANTUM MECHANICS	6		
	Wave Function and Its Significance	1	1	1, 2
	Schrodinger's equation, operators and observables.	1	1	1, 2
	Expectation values and qualitative introduction to the uncertainty principle.	1	1	1, 2
	Particle in a One-Dimensional Potential Box and Step potentials	1	1	1, 2
	Potential barriers and Tunneling effect (Concept only)	1	1, 2	1, 2
	Quantum Harmonic Oscillator and zero-point energy	1	1, 2, 3	1, 2
Unit No.	INTRODUCTION TO QUANTUM COMPUTATION AND MATERIALS	6		

5	Limitations of classical computation, Classical bits vs quantum bits	1	1	3, 4
	Mathematical representation of Qubits	1	1	3, 4
	Concepts of Superposition and Entanglement	1	1	3, 4
	Basics Quantum Algorithms	1	1, 2, 3	3, 4
	Introduction to Quantum Materials and Realization of Physical Qubits	1	1, 2, 3	3, 4
	Applications of Quantum Technologies and Future Scopes	1	1	3, 4
TOTAL CONTACT HOURS		30		

Course Unitization Plan: Laboratory

Exp No.	Syllabus Topics	Required Contact Hours	CLOs Addressed	References Used
1	Hooke's law and determination of spring constant for a given spring	4	1, 4	4
2	Michelson interferometer kit with diode laser	4	1, 4	4
3	He-Ne laser kit: Optical Interference and Diffraction	4	1, 4	4
4	Diffraction by Grating and Particle size measurement	4	1, 4	4
5	Dielectric constant of air using dielectric constant kit.	4	1, 4	4
6	Verification of Stefan's Law	4	1, 4	4
7	Biot-savart law: To study the dependence of magnetic field on the current and magnetic field along the axis of a current carrying circular loop	4	1, 4	4
8	Faraday law & Induced E.M.F: Measurement of the induced voltage and calculation of the magnetic flux induced by a falling magnet	4	1, 4	4
9	Practice and model exam	8	1, 4	4

Learning Assessment

Bloom’s Level of Cognitive Task		Continuous Learning Assessments (50 %)								End Semester Exam (50 %)	
		CLA-1 (15 %)		CLA-2 (15 %)		CLA-3 (—%)		Mid Term (20 %)			
		Th	Prac	Th	Prac	Th	Prac	Th	Prac	Th	Prac
Level 1	Remember	10%	5%	10%	5%			20%		10%	5%
	Understand	10%	5%	10%	5%			20%		10%	5%
Level 2	Apply	30%	10%	30%	10%			40%		30%	10%
	Analyse	10%	20%	10%	20%			20%		10%	20%
Level 3	Evaluate										
	Create										
Total		60%	40%	60%	40%			100%		60%	40 %

Recommended Resources

1. Serway, R. A., & Jewett, J. W. (2017). Physics for Scientists and Engineers with Modern Physics (9th ed.). Cengage India Private Limited.
2. Young, H. D., Freedman, R. A., & Ford, L. C. (2018). University Physics with Modern Physics with Mastering Physics (12th ed.). Pearson.
3. Michael A. Nielsen and Isaac L. Chuang (2000). Quantum Computation and Quantum Information. Cambridge University Press
4. Phillip Kaye, Raymond Laflamme, and Michele Mosca (2007). An Introduction to Quantum Computing. Oxford University Press.

Recommended Online Resources

5. Department of Physics, SRM University AP. Engineering Physics lab manuals. Retrieved from Engineering Physics Lab (FIC102) <https://srmap.edu.in/seas/physics-teaching-lab/>